

Amendments to the Specification:

Please amend the specification as follows:

[0002]

A linear guide device using rollers as rolling elements generally includes a rail having ~~rail-side raceway surface on~~ a lateral left face and a lateral right face surface, a slider having a front end face and a rear end face in the longitudinal direction of the rail and end caps each attached on the front end face and the rear end face of the slider, in which slider-side raceway surfaces opposed to rail-side raceway surfaces formed on the lateral left face and the lateral right face of the rail are formed on two opposing inner lateral faces of the slider. Further, the linear guide device of this type has a plurality of rollers. The rollers are adapted to roll through rolling element rolling channels formed between the rail-side raceway surfaces and the slider-side raceway surfaces by the relative movement of the slider in the longitudinal direction of the rail. Then, the rollers rolling through the rolling element rolling channels change direction in direction changing channels for rolling elements formed in the end cap, then return to the original position through rolling element returning channels formed in the slider along the longitudinal direction of the rail, and again circulate the path described above.

[0005]

For attaining such objects, the invention of claim 1 provides a linear guide device including a rail having ~~a rail-side raceway surface on~~ a lateral left face and a lateral right face, a slider having a front end face and a rear end face in the longitudinal direction of the rail and having slider-side raceway surfaces opposing to rail-side raceway surfaces formed on the lateral left face and the lateral right face of the rail, end caps each attached to the front end face and the rear end face of the

slider, a plurality of rollers that roll along with the relative linear motion of the slider through circulation channels formed of rolling element rolling channels formed between the rail-side raceway surfaces and the slider-side raceway surfaces, rolling element returning channels formed in the slider along the longitudinal direction of the rail and direction changing channels for rolling elements formed in the end caps, and a plurality of retaining pieces each disposed between the rollers, in which the retaining pieces have a retaining piece body having a lateral left face and a lateral right face, a first arm portion extending from the lateral left face of the retaining piece body toward end faces of the two adjacent rollers and fitting a first guide groove formed to one of wall surface portions of the circulation channels, and a second arm portion disposed in parallel with the first arm portion on the lateral right face of the retaining piece body and fitting a second guide groove formed to the other of the wall surface portion of the circulation channels, wherein the height for the retaining piece body and the height of the arm portion are defined to such a height that satisfies the conditional relation: $(H1 - H2)/2 < (Dw - W)/2$ where H1 represents the height of the retaining piece body in the direction crossing the axial direction of the roller, H2 represents the height of the first and the second arm portions in the direction crossing the axial direction of the roller, W represents the width of the first and the second guide grooves in the direction crossing the axial direction of the roller, and Dw represents the diameter of the roller.

[0006]

The invention of claim 2 provides a linear guide device including a rail having ~~a rail-side raceway surface on~~ a lateral left face and a lateral right face, a slider having a front end face and a rear end face in the longitudinal direction of the rail and having slider-side raceway surfaces opposing to rail-side raceway surfaces formed on the lateral left face and the lateral right face of the rail, end caps each attached to the front end face and the rear end face of the slider, a plurality of rollers that roll along with the relative linear motion of the slider through circulation

channels formed of rolling element rolling channels formed between the rail-side raceway surfaces and the slider-side raceway surfaces, rolling element returning channels formed in the slider along the longitudinal direction of the rail and direction changing channels for rolling elements formed in the end caps, and a plurality of retaining pieces each disposed between the rollers, in which the retaining pieces have a retaining piece body having a lateral left face and a lateral right face, a first arm portion extending from the lateral left face of the retaining piece body toward end faces of the two adjacent rollers and fitting a first guide groove formed to one of wall surface portions of the circulation channels, and a second arm portion disposed in parallel with the first arm portion on the lateral right face of the retaining piece body and fitting a second guide groove formed to the other of the wall surface portion of the circulation channels, wherein the height of the first and the second arm portions in the direction crossing the axial direction of the roller is defined as a height that satisfies the conditional relation: $0.2 \leq H2/Dw \leq 0.5$ where H2 represents the height of the arm portions and Dw represents the diameter of the roller.

[0007]

The invention of claim 3 provides a linear guide device including a rail having ~~a rail-side raceway surface on~~ a lateral left face and a lateral right face, a slider having a front end face and a rear end face in the longitudinal direction of the rail and having slider-side raceway surfaces opposing to rail-side raceway surfaces formed on the lateral left face and the lateral right face of the rail, end caps each attached to the front end face and the rear end face of the slider, a plurality of rollers that roll along with the relative linear motion of the slider through circulation channels formed of rolling element rolling channels formed between the rail-side raceway surfaces and the slider-side raceway surfaces, rolling element returning channels formed in the slider along the longitudinal direction of the rail and direction changing channels for rolling elements formed in the end caps, and a plurality of retaining pieces each disposed between the rollers, in which the retaining pieces have a retaining piece body having a lateral left face and a lateral right face, a first arm

portion extending from the lateral left face of the retaining piece body toward end faces of the two adjacent rollers and fitting a first guide groove formed to one of wall surface portions of the circulation channels, and a second arm portion disposed in parallel with the first arm portion on the lateral right face of the retaining piece body and fitting a second guide groove formed to the other of the wall surface portion of the circulation channels, wherein the length of the first and the second arm portions is defined to such a length that both ends of the first and the second arm portions are situated to the outside of a circle having the center at a central portion of the retainer piece body and having a diameter H3, where H3 represents the distance between an outer lateral face of the first arm portion and an outer lateral face of the second arm portion.

[0011]

The invention of claim 10 provides a linear guide device according to claim 8 wherein the end portion of the inner lateral face of the first and the second arms is formed as a tapered face relative to the end face of the roller.

The invention according to claim 11 provides a linear guide device including a rail having ~~a rail-side raceway surface on~~ a lateral left face and a lateral right face, a slider having a front end face and a rear end face in the longitudinal direction of the rail and having slider-side raceway surfaces opposing to rail-side raceway surfaces formed on the lateral left face and the lateral right face of the rail, end caps each attached to the front end face and the rear end face of the slider, a plurality of rollers that roll along with the relative linear motion of the slider through circulation channels formed of rolling element rolling channels formed between the rail-side raceway surfaces and the slider-side raceway surfaces, rolling element returning channels formed in the slider along the longitudinal direction of the rail and direction changing channels for rolling elements formed in the end caps, and a plurality of retaining pieces each disposed between the rollers, in which the retaining pieces have

a retaining piece body having a lateral left face and a lateral right face, a first arm portion extending from the lateral left face of the retaining piece body toward end faces of the two adjacent rollers and fitting a first guide groove formed to one of wall surface portions of the circulation channels, and a second arm portion disposed in parallel with the first arm portion on the lateral right face of the retaining piece body and fitting a second guide groove formed to the other of the wall surface portion of the circulation channels, and has a minimum thickness at a portion put between the two adjacent rollers, wherein plural kinds of retaining pieces each of different minimum thickness are each interposed between each of the rollers, and each of the retaining pieces is applied with a identification mark for identifying the kind thereof.

[0017]

Retaining pieces 15 (refer to Fig. 3) formed of a resin material are interposed between each of the rollers 9. ~~The~~ Each of the retaining pieces 15, as shown in Fig. 4 and Fig. 5, comprises a retaining piece body 16 having two lateral face portions 161 and 162 in parallel with the end face portion 91 of the roller 9. The retaining piece body 16 is formed with a first roller retaining face 17 for retaining a circumferential surface of one roller 9 of the two adjacent rollers 9 and formed with a second roller retaining face 18 for retaining the circumferential surface of the other roller 9 of the two adjacent rollers 9 as shown in Fig. 6.

[0025]

Retaining pieces 15 formed of a resin material (refer to Fig. 3) are interposed between each of the rollers 9. ~~The~~ Each of the retaining pieces 15 comprise a retaining piece body 16 having two lateral face portions 161 and 162 in parallel with the end face portion 91 of the roller 9. The retaining piece body 16 is formed with a first roller retaining face 17 for retaining a circumferential surface of one roller 9 of the two adjacent rollers 9 and formed with a second roller retaining face 18 for retaining the

[0030]

$$B = 2((Dw/2 - Cw)^2 - (Dw/2 - H)^2)^{0.5} \quad (3)$$

Further, assuming the axial length of the roller 9 as L_w and the distance between the lateral right face 211 and the lateral left face 212 of the circulation channel 21 as L_a , the axial gap Δa between the roller end faces 91 and the circulation channel 21 ~~for the roller 9~~ can be determined by the following equation:

$$\Delta a = L_a - L_w \quad (4)$$

In such a circulation channel 21, a maximum skew angle θ in a case where the roller 9 causes skew and the roller 9 abuts against the wall surface of the circulation channel 21 as shown in Fig. 16 is expressed approximately according to the following equation:

[0040]

Retaining pieces 15 (refer to Fig. 23) formed of, for example, an elastomer material are interposed between each of the rollers 9. ~~The~~ Each of the retaining pieces 15 comprise a retaining piece body 16 having two lateral face portions 161 and 162 in parallel with the end face portion 91 of the roller 9 (refer to Fig. 25). The retaining piece body 16 is formed with a first roller retaining face 17 for retaining a circumferential surface of one roller 9 of the two adjacent rollers 9 and formed with a second roller retaining face 18 for retaining the circumferential surface of the other roller 9 of the two adjacent rollers 9 as shown in Fig. 24.

[0053]

Retaining pieces 15 (refer to Fig. 37) formed of a resin material are interposed

between each of the rollers 9. ~~The~~ Each of the retaining pieces 15 comprise a retaining piece body 16 having two lateral face portions 161 and 162 in parallel with the end face portion 91 of the roller 9 (refer to Fig. 36). The retaining piece body 16 is formed with is formed with a first roller retaining face 17 for retaining a circumferential surface of one roller 9 of the two adjacent rollers 9 and formed with a second roller retaining face 18 for retaining the circumferential surface of the other roller 9 of the two adjacent rollers 9 as shown in Fig. 35.